PATENT SPECIFICATION

734,267

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COMPLETE SPECIFICATION

Improvements in Vehicle Suspension Assembly

We, AUTO UNION G.m.b.H., a Body Corporate organised under the Laws of Germany, of Schrannenstrasse 3, Ingolstadt, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to chassis frames and more particularly to suspension assemblies for motor vehicles.

A substantial part of the weight of a motor vehicle is formed by the weight of the chassis frame, owing to the latter having to be constructed so as to be as resistant as possible to bending and torsion, if the vehicle body is to be relieved of unduly high stresses, as is generally desirable. Known torsion-resisting frames are invariably of relatively heavy weight for this reason, and for the further reason that they must be capable of absorbing the forces due to the suspension of the road wheels from the chassis frame so that the latter effectively resists torsion even when the wheels, for example the front wheels on bad roads, make violent springing movements relatively to the frame.

The conventional method of making the chassis torsion-resisting is to build it up of two longitudinal frame members having a high moment of resistance and interconnected by transverse members at several points from the front ends to the rear ends of the longitudinal members. In many cases the transverse members serve at the same time for securing the vehicle body thereto, or brackets may be mounted on so as to project laterally from the longitudinal members, which brackets are used as additional points of anchorage of the vehicle body. For the front-wheel spring-suspension it is also known, in such chassis frames, to suspend semi-elliptical leaf springs from the longitudinal frame members by means of shackles, both wheels being usually mounted on a single front axle in such suspensions. Additional transverse members may be provided to serve as engine bearers.

The object of the present invention is to provide improvements in the construction of chassis frames and associated wheel suspensions.

According to the present invention a vehicle sprung wheel torsion bar suspension assembly comprises a chassis frame having two longitudinal members connected by at least a front and a rear transverse member, said longitudinal members each having a free end extending beyond said front transverse member and each carrying a longitudinally disposed torsion bar spring, characterized in that each extending free end pivotally supports a wheel supporting arm and said torsion bar spring is anchored to said longitudinal member at the connection thereof with the front transverse member, beyond which it extends, and an additional wheel supporting arm is provided and pivotally supported from the vehicle body. Only one other transverse member interconnecting the longitudinal members may be provided rearwardly of said front transverse member, said rear transverse member being located adjacent the rear ends of the longitudinal members.

In this way only the part of the frame between said front and rear transverse members is subject to torsional stresses, that is to say in effect, the frame part between the rear edges of the front wheels and the front edges of the rear wheels. This frame part is so short, however, that a torsion-resisting frame can be built with a minimum of material, which will therefore be of light weight, particularly in the case of vehicles with a short wheel base.

According to a further feature of the invention, the forwardly extending free ends may be hollow and may house the torsion bar springs associated with the front wheel suspension. The springs are thus out of the way,

thereby facilitating inspection of, and access to, the adjacent parts, as well as protecting the springs from the weather.

In a suspension assembly according to the invention the front portion of the frame is advantageously utilised for the dual function of accommodating not only the suspension springs but also the journalling means of the lower suspension arm. The upper arm is subject to only a small proportion of the stresses transmitted from the front wheel which can therefore be readily taken up by a vehicle body wall or its thin sheet-metal reinforcement.

The shape of the chassis frame, particularly in the part between said front and rear transverse members, will obviously be of considerably importance in contributing towards the torsion-resisting properties of the frame. While any suitable shape may be used, the present invention proposes a few constructions which will be found particularly advantageous.

Thus, in the simplest embodiment of the invention, each of the longitudinal members, as seen in plan, extends in a straight line continuously from front to rear. This makes for ease in manufacture, so that the frame is cheap to make, even when not produced in large numbers. If in this construction the spacing between the longitudinal members, particularly when they are parallel to each other, is too small for a given type of vehicle body, a few laterally projecting brackets can easily be secured to the frame to provide points of suport for the body.

In another embodiment, for example, the longitudinal members are tongs-shaped as seen in plan, i.e., they diverge from the front to a point on either side of the middle and then converge again towards the rear. Although the longitudinal members in this construction require an additional operation in manufacture to form them to this shape the advantage is nevertheless retained of using a single longitudinal member extending continuously from front to rear, while the particular shape proposed affords reasonable protection to passengers, in the case of collisions or like street accidents, against heavy impact from the sides of the vehicle in the vicinity of the doors.

Alternatively, however, the frame may be so shaped that the longitudinal members converge from the front towards the middle and then diverge again towards the rear. This embodiment is comparatively simple to manufacture and is particularly suitable in cases where it is desired to provide a chassis capable of having any one of several different body constructions mounted thereon. It will generally be necessary to secure a few laterally projecting brackets to this form of frame to support the body, especially if the longitudinal members, after converging from the front, extend in closely spaced parallel relation for some distance in the middle, before diverging again towards the rear, and in order to adapt this frame for different body constructions there is no need to alter the frame itself, it being sufficient merely to lengthen or shorten the brackets or to alter their position, depending on whether a broader or narrower body or one of a somewhat different shape altogether is to be mounted on the frame.

A particularly valuable embodiment of the invention is one in which the longitudinal members are discontinuous, being interrupted by said front transverse member so that said forwardly extending free ends of the longitudinal members are inset with respect to the adjacent portions of the rearwardly extending remainder of the longitudinal members, such remainder being shaped, as seen in plan, in substantial conformity with the contours of the vehicle body part to be connected thereto. In this construction of the chassis frame, the latter serves at the same time as a base frame for the vehicle body, so that in the case of accidents, such as skidding sideways against trees or lamp-posts, the longitudinal frame members, being disposed right over to the sides of the vehicle and spaced far apart throughout the greater part of their length, are the first to receive the shock of impact and thus keep the worst of the resulting stresses away from the vulnerable bodywork.

The longitudinal members may be of any desired cross-sectional shape, but it has been found most advantageous to make them tubular. Not only are they in this way better adapted to accommodate the torsion-bar suspension springs, but they are more economical to make, since a tube of relatively small wall thickness can have a great moment of resistance.

In order to preserve from torsional stresses the forwardly extending free ends of the longitudinal members, i.e., the portions projecting forwardly from the front transverse member, it is proposed, according to the invention, to anchor each torsion-bar spring member to one of said front portions of the longitudinal members at the connection thereof with said front transverse member. The effect is that said forwardly extending free ends have only to support the lower suspension arm and to take the ordinary stresses caused thereby, whereas the combined forces resulting in torsion are all absorbed by the trussed part of the chassis frame adjacent to and including the front transverse member.

A contribution towards the main aim of the invention namely to have the torsional stresses act upon as short a portion of the chassis frame as possible, can be made by mounting the rear axle within the rear transverse member which, being connected across the rear ends of the longitudinal members,

lies in front of the rear wheels. Any part of the vehicle disposed rearwardly of this rear transverse member is therefore not subjected to any stresses transmitted through the wheels so that the vehicle body, for example, can have its rear portion projecting in cantilever fashion beyond the chassis frame and is only required to bear the load due to its own weight and to any passengers in the rear seats and/or any luggage or freight caried in the rear portion of the body.

A few embodiments of the invention will now be described in greater detail by way of example with reference to the accompanying drawings, wherein:—

Figs. 1 to 4 are diagrammatic top plans of four different forms of motor vehicle chassis frames respectively made according to the invention, the vehicle engine being omitted in Figs. 1, 3 and 4;

Fig. 5 is a part-sectional top plan of the left-hand front wheel and its suspension system; and

Fig. 6 is a rear view of the parts shown in Fig. 5, partly in section along the line VI—VI of Fig. 5.

The same reference numerals are used throughout the drawings to designate like parts.

In the form shown in Fig. 1, the chassis comprises a frame consisting of two longitudinal members 1 and 2 extending continuously through from front to rear and rear and front transverse members 3 and 4 respectively interconnecting the longitudinal members. The frame so formed ends in front of the centres of the rear wheels 5 which are mounted on crank arms 6. The rear wheels are sprung by torsion-bars 7 consisting of stacked leaf-spring assemblies connected to the arms 6. The two torsion-bars 7 may thus be regarded as forming the rear axle and are mounted within the rear transverse member 3, which is made tubular for this purpose. The front transverse member 4 is disposed rearwardly of the front wheels and is connected to the longitudinal members 1 and 2 at points such that the latter have their front portions 8 and 9 respectively projecting freely beyond the member 4. The front portions 8 and 9 are also tubular, as indeed is the whole of each longitudinal member. Inserted into the hollow front portions 8 and 9 from the ends thereof are torsion-bars 10 and 11 respectively which again consist of assemblies of stacked leaf-springs. The front wheels are each suspended by means of two swinging arms, of which only the lower ones, designated 12 and 13 respectively, are shown in Fig. 1. The arms 12 and 13 are secured to the ends of the torsion-bars 10 and 11 respectively and are journalled in the hollow front portions 8 and 9 respectively in a manner which will hereinafter be described with reference to Figs. 5 and 6, as will also be the manner of connection of the torsion-bars 10 and 11 to the front portions 8 and 9 respectively at the points 14 and 15 respectively where the transverse member 4 intersects the longitudinal members 1 and 2. Laterally and outwardly projecting brackets 16 are attached to the longitudinal members 1 and 2 to serve as points of connection of the vehicle body to the chassis.

Whereas in Fig. 1 each of the longitudinal members 1 and 2 extends in a straight line, the two members being parallel throughout their length, the embodiment shown in Fig. 2 has longitudinal members 1*a* and 2*a* which together form the shape of a pair of tongs, diverging from front to rear as far as points 17 and 18, here shown as located on the rear side of the middle of the frame, where the members 1*a* and 2*a* are spaced farthest apart, the points 17 and 18 being situated approximately underneath the walls of the vehicle body (not shown) so that it will not generally be necessary to provide laterally projecting brackets for securing the vehicle body thereto. From points 17 and 18, the members 1*a* and 2*a* converge again towards the rear transverse member 3. The front transverse member, here designated 4*a*, is slightly bent in the middle so that its two limbs are about at right angles to the front portions 8 and 9 of the longitudinal members 1*a* and 2*a* respectively. For the rest, the construction is similar to that of Fig. 1. A vehicle engine 19 is shown in Fig. 2 mounted in front of the centres of the front wheels; the engine 19 is supported, not by the frame members 1*a* and 2*a*, but by parts of the vehicle body which are not shown.

The only substantial difference between the embodiments of Figs. 2 and 3 is that in the latter the longitudinal frame members, denoted 1*b* and 2*b*, are shaped so that together they form a kind of X, the limbs of which do not intersect, i.e., the two members 1*b* and 2*b* converge towards the middle and then diverge again; in the particular form shown they extend in closely spaced parallel relation for some distance at either side of the middle. Laterally projecting brackets will generally be necessary in this construction for securing the vehicle body thereto.

In the embodiment according to Fig. 4, the longitudinal frame members, designated 1*c* and 2*c*, are discontinuous, being interrupted by the front transverse member which is here denoted 4*c*. The front portions 8 and 9 of the longitudinal members 1*c* and 2*c* are thus offset from the middle portions thereof which begin at the extremities of the transverse member 4*c* and extend parallel to each other, with the resulting wide spacing between them, to near the rear end where they are joined to the rear transverse member 3 by means of arcuate connecting pieces 20 and 21 respectively forming part of the longitudinal mem-

bers 1*c* and 2*c*. The latter are thus adapted at the same time to form the base frame for the vehicle body or its supporting structure.

Referring now to Figs. 5 and 6, the tubular front portion 9 of a longitudinal frame member is shown as passing through, and welded to, the front transverse member 4. The laminated leaf-spring torsion-bar member 11 is rigidly anchored by an annular connecting piece 22 to the inside of the longitudinal frame member at the point of intersection thereof with the transverse member 4. The torsion-bar member 11 extends longitudinally within the front portion 9 and has one end projecting therefrom which is secured to the lower suspension arm 13. The latter is hollow and cranked to provide a journal part which extends substantially at right angles to the main part of the arm 13 and into the tubular end of the longitudinal member portion 9 where it is mounted for rotation by means of bearing rings 23 and 24.

The upper suspension arm of the front wheel is indicated at 28 in Fig. 6 and is pivoted by means of a hinge 25 to a wall part 26 of the vehicle body mounted on the chassis, the part indicated at 27 being an ordinary sheet-metal transverse reinforcement or brace of the vehicle body.

It is within the scope of this invention to provide the front portions 8 and 9 of the longitudinal frame members with intermediate members (not shown) on the level of the front wheels, for example for suspending the vehicle engine. An important feature of the constructions described in the foregoing, apart from the shortness of the middle portion of the chassis which gives the frame very good torsion-resisting properties, are those which bring about the advantages of enabling the front wheel suspension springs to be accommodated within the longitudinal frame members, simplifying assembly work in that the lower suspension arms need only be introduced from the front into the ends of the longitudinal members and causing the torsional stresses due to the front wheels to be taken up by the points of connection between the longitudinal members and the front transverse member.

What we claim is:—

1. A vehicle sprung wheel torsion bar suspension assembly comprising a chassis frame having two longitudinal members connected by at least a front and a rear transverse member, said longitudinal members each having a free end extending beyond said front transverse member and each carrying a longitudinally disposed torsion bar spring, characterized in that each extending free end pivotally supports a wheel supporting arm and said torsion bar spring is anchored to said longitudinal member at the connection thereof with the front transverse member, beyond which it extends, and an additional wheel supporting arm is provided and pivotally supported from the vehicle body.

2. A vehicle suspension assembly as claimed in Claim 1 wherein said longitudinal members are discontinuous, the centre portions being spaced apart a distance greater than the track width of the front wheels, the forwardly extending free ends being secured to the front transverse member to lie between the front wheels and spaced apart a distance less than the track width of the front wheels.

3. A vehicle suspension assembly according to Claim 2 characterized in that the forwardly extending free ends are hollow and adapted to house the torsion bar springs associated with the front wheel suspension.

4. A vehicle suspension assembly constructed substantially as shown in, and hereinbefore described with reference to, any one of Figs. 1 to 4, and Figs. 5 and 6, of the accompanying drawings.

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Fig. 1

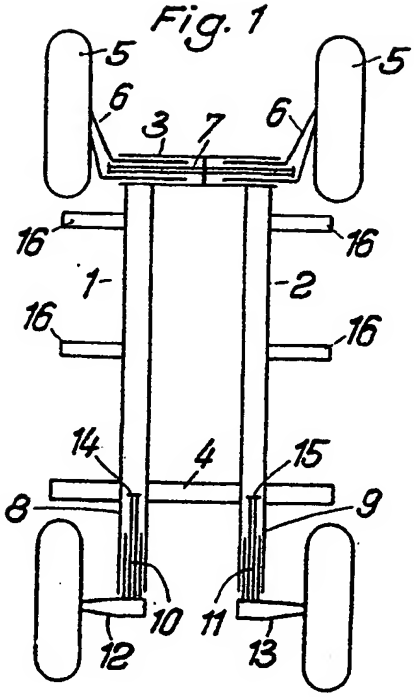


Fig. 2

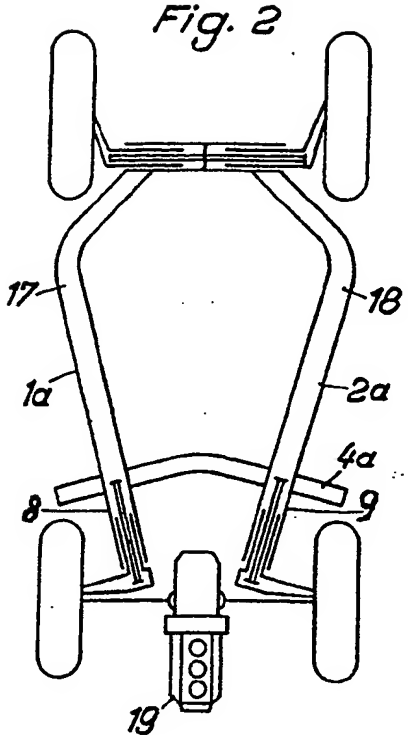


Fig. 3

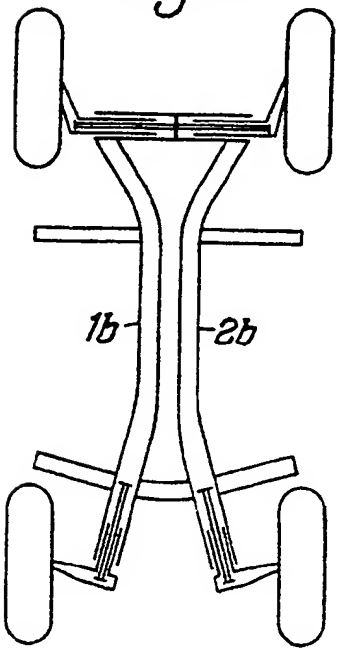
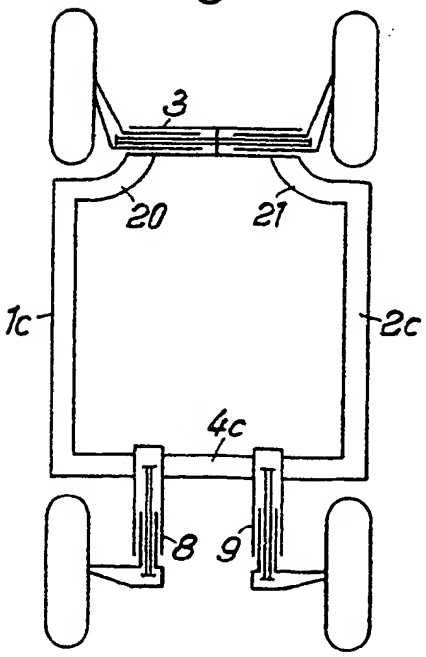


Fig. 4



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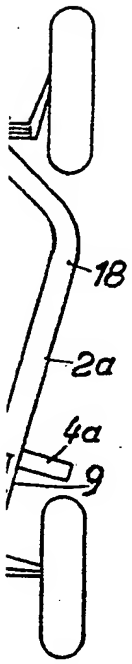
2 SHEETS

Fig. 5



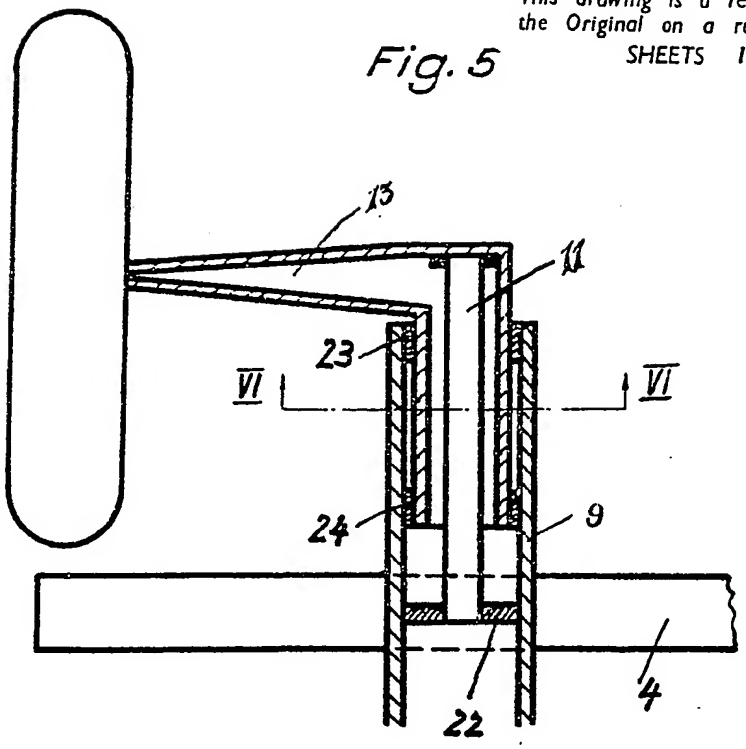
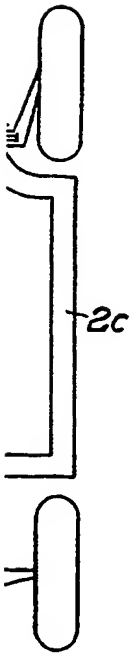
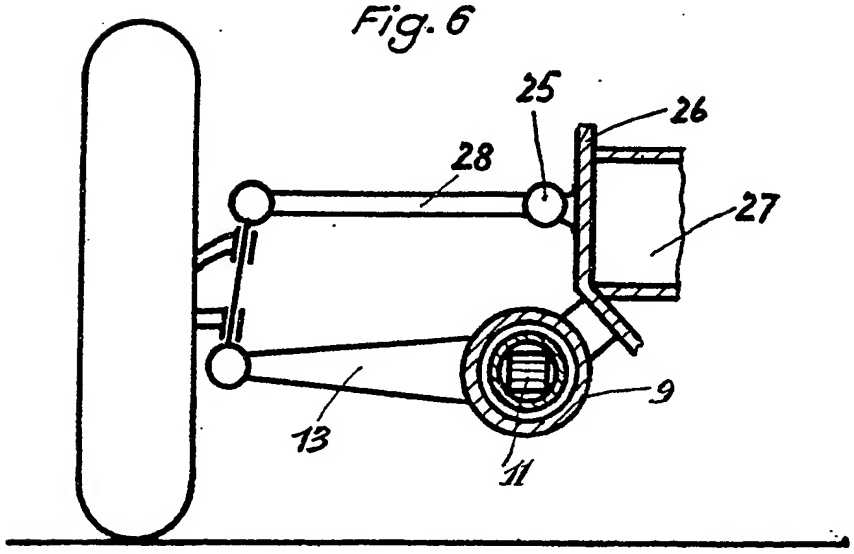


Fig. 6





734,267 COMPLETE SPECIFICATION
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This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

Fig. 1

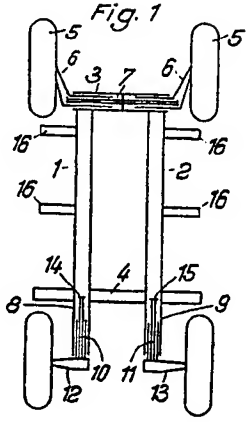

Fig. 2

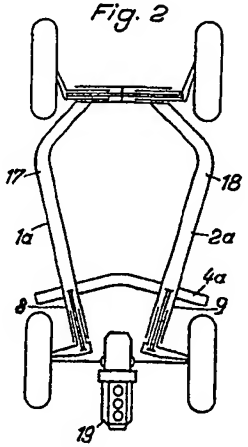

Fig. 5

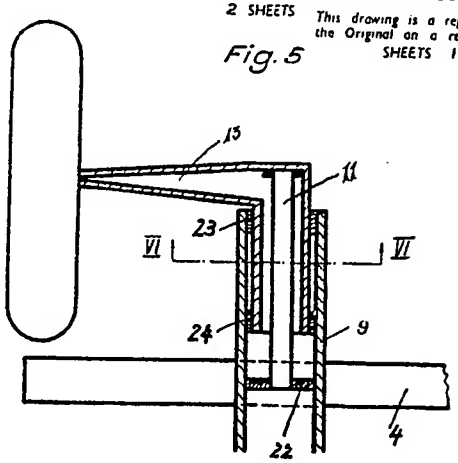

Fig. 3

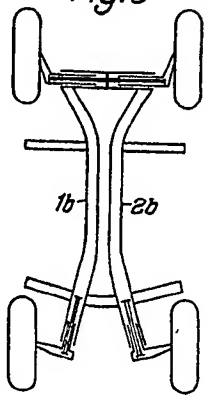

Fig. 4

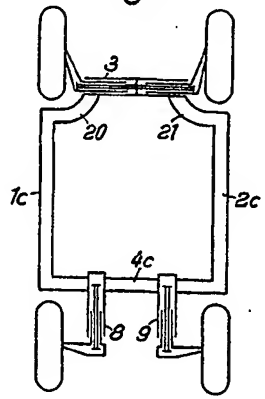

Fig. 6